11.3 Perimeters and Areas of Similar Figures

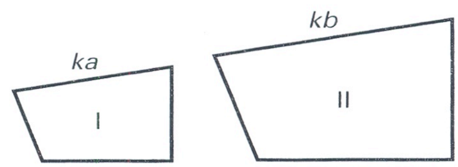
Goals
- Compare perimeters and areas of similar figures.
- Use perimeters and areas of similar figures to solve real-life problems.

THEOREM 11.5: AREAS OF SIMILAR POLYGONS

If two polygons are similar with the lengths of corresponding sides in the ratio of $a : b$, then the ratio of their areas is ____ : ____.

$$\frac{\text{Side length of Quad. I}}{\text{Side length of Quad. II}} = \underline{\qquad}$$

$$\frac{\text{Area of Quad. I}}{\text{Area of Quad. II}} = \underline{\qquad}$$



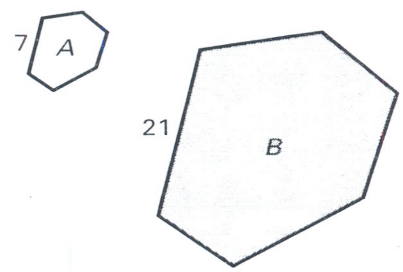
Quad. I ~ Quad. II

Example 1 *Finding Ratios of Similar Polygons*

Hexagons A and B are similar.

a. Find the ratio (unshaded to shaded) of the perimeters of the hexagons.

b. Find the ratio (unshaded to shaded) of the areas of the hexagons.



Solution

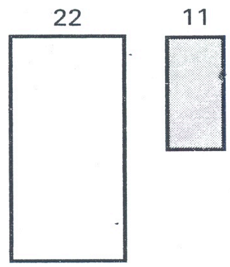
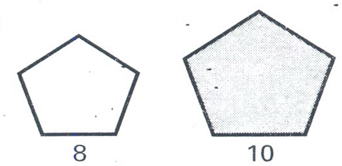
The ratio of the lengths of corresponding sides in the hexagons is

$\frac{\underline{\qquad}}{\underline{\qquad}} = \frac{\underline{\qquad}}{\underline{\qquad}}$, or ___ : ___.

a. The ratio of the perimeters is also ___ : ___. So, the perimeter of hexagon A is __________ the perimeter of hexagon B.

b. Using Theorem 11.5, the ratio of the area is ____ : ____, or ___ : ___. So, the area of hexagon A is __________ the area of hexagon B.

Checkpoint The polygons are similar. Find the ratio (unshaded to shaded) of their perimeters and of their areas.

1. 	**2.** 

Example 2 *Using Areas of Similar Figures*

Comparing Costs You want to carpet a room that measures 40 feet by 48 feet. An advertisement states that the cost to carpet a room that measures 10 feet by 12 feet is $216. What is a reasonable cost for the larger room?

Solution

The ratio of the lengths of corresponding sides are equal. The ratio of the side lengths is 1 : ___. So, the ratio of the areas is 1^2 : ____, or 1 : ____.

Because the cost of the carpet should be a function of its area, the carpet for the larger room should cost about _________ times that of the smaller room.

___ × 216 = ______

Answer A reasonable cost for the larger room is $______.

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Study Guide

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Perimeters and Similarity

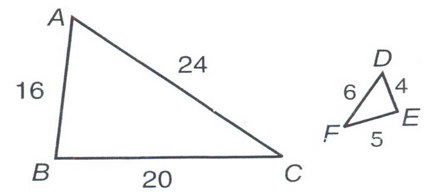
If two triangles are similar, then the measures of the corresponding perimeters are proportional to the measures of the corresponding sides.

Example: Determine the scale factor of $\triangle ABC$ to $\triangle DEF$.

$\frac{AB}{DE} = \frac{16}{4}$ or 4 $\quad \frac{BC}{EF} = \frac{20}{5}$ or 4

$\frac{CD}{FD} = \frac{24}{6}$ or 4

The scale factor is 4.



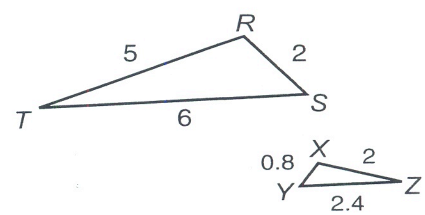
In the figure, △RST ~ △XYZ.

1. Find the scale factor of $\triangle XYZ$ to $\triangle RST$.

2. Find the perimeter of $\triangle RST$.

3. Find the perimeter of $\triangle XYZ$.

4. What is the ratio of the perimeters of $\triangle RST$ to $\triangle XYZ$?

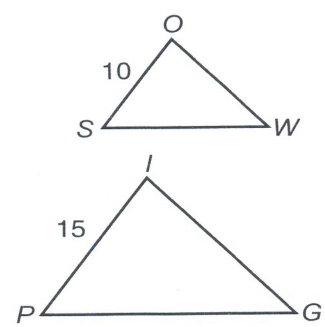


In the figure, △WOS ~ △GIP, the perimeter of △GIP is 5x + 19, and the perimeter of △WOS is 36.

5. Find the scale factor of $\triangle WOS$ to $\triangle GIP$

6. Find x.

7. Find the perimeter of $\triangle GIP$.



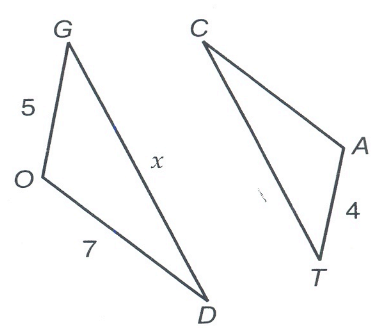
In the figure, △CAT ~ △DOG, and the perimeter of △CAT is 18.

8. Which side of $\triangle DOG$ corresponds to $\overline{AT}$ in $\triangle CAT$?

9. Write an expression for the perimeter of $\triangle DOG$.

10. Find x.

11. Find the perimeter of $\triangle DOG$.



LESSON 11.3

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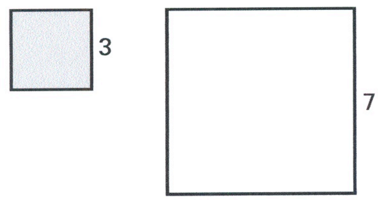
Practice A

For use with pages 677–682

The polygons shown are similar. Find the ratio (shaded to unshaded) of their perimeters and of their areas.

1.



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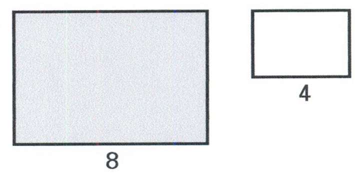

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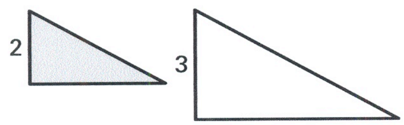
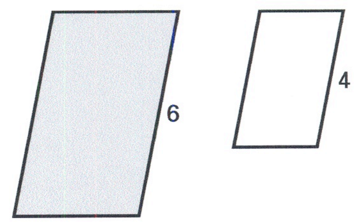


4.



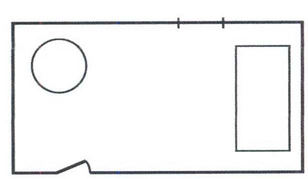
Complete the statement using *always, sometimes,* or *never*.

5. Two similar quadrilaterals ___?___ have the same perimeter.
6. Two squares with the same perimeter are ___?___ similar.
7. Two regular hexagons are ___?___ similar.
8. Two right triangles with the same area are ___?___ similar.

Solve.

9. The ratio of the lengths of corresponding sides of two similar triangles is 5:8. What is the ratio of their areas?
10. The ratio of the areas of two similar triangles is 16:9. What is the ratio of the lengths of corresponding sides?
11. A regular pentagon has an area of 48 square centimeters. Find the scale factor of this pentagon to a similar pentagon that has an area of 75 square centimeters.
12. The ratio of the lengths of corresponding sides of two similar rectangles is 3:5. The smaller rectangle has an area of 36 square centimeters. What is the area of the larger rectangle?

In Exercises 13–15, use the diagram of the room and a ruler. The scale is 1 centimeter to 1 meter.



13. Use a ruler to approximate the dimensions of the room.
14. What are the dimensions of the actual room?
15. Show that the area of the model to the area of the actual room is 1 cm^2 to 1 m^2.

Lesson 11.3